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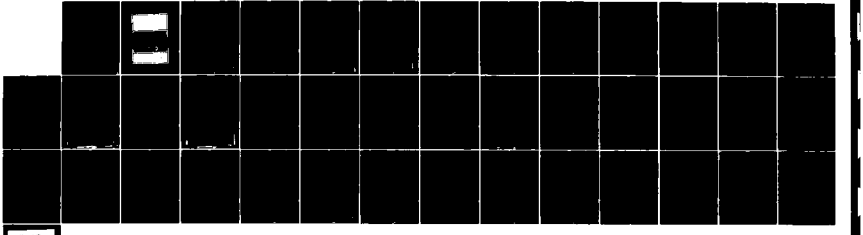

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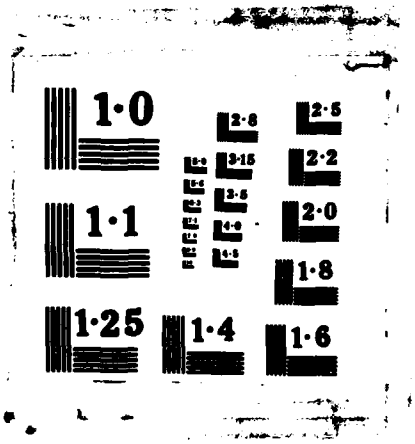
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AGARD

ADVISORY GROUP FOR AEROSPACE RESEARCH & DEVELOPMENT

7 RUE ANCELLE 92200 NEUILLY SUR SEINE FRANCE

AGARD BULLETIN

TECHNICAL PROGRAMME 1986

AUGUST 1985 85/2

NORTH ATLANTIC TREATY ORGANIZATION

DISTRIBUTION AND AVAILABILITY ON BACK COVER

THE MISSION OF AGARD

The mission of AGARD is to bring together the leading personalities of the NATO nations in the fields of science and technology relating to aerospace for the following purposes:

- Exchanging of scientific and technical information;
- Continuously stimulating advances in the aerospace sciences relevant to strengthening the common defence posture;
- Improving the co-operation among member nations in aerospace research and development;
- Providing scientific and technical advice and assistance to the North Atlantic Military Committee in the field of aerospace research and development;
- Rendering scientific and technical assistance, as requested, to other NATO bodies and to member nations in connection with research and development problems in the aerospace field;
- Providing assistance to member nations for the purpose of increasing their scientific and technical potential;
- Recommending effective ways for the member nations to use their research and development capabilities for the common benefit of the NATO community.

The highest authority within AGARD is the National Delegates Board consisting of officially appointed senior representatives from each member nation. The mission of AGARD is carried out through the Panels which are composed of experts appointed by the National Delegates, the Consultant and Exchange Programme and the Aerospace Applications Studies Programme. The results of AGARD work are reported to the member nations and the NATO Authorities through the AGARD series of publications of which this is one.

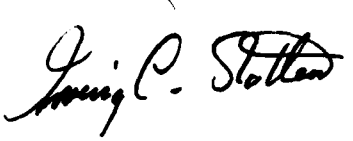
Participation in AGARD activities is by invitation only and is normally limited to citizens of the NATO nations.

Published August 1985

Set and Printed by Specialised Printing Services Limited
40 Chigwell Lane, Loughton, Essex IG10 3TZ

PREFACE

This Bulletin presents the 1986 programme approved by the AGARD National Delegates Board. Section I includes a chronological listing of the meetings tentatively scheduled to take place during 1986 and Section II gives a detailed description of the individual Panel Programmes, the Consultant and Exchange Programme, and the Military Committee Studies Programme. The total budget required to support the Proposed 1986 AGARD Technical Programme is presented in Section III. The Publication Summary in Section IV identifies by activity the AGARD publications scheduled for publication in 1986. (NATO)



Director

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I – TENTATIVE CALENDAR OF MEETINGS – 1986

TENTATIVE CALENDAR OF MEETINGS 1986

CALENDRIER PROVISOIRE DES REUNIONS PREVUES EN 1986

Dates *Dates*	Location *Lieu*	Panel *Panel*	Type of Meeting/Subject *Type/Sujet de Réunion*
17—21 February	BELGIUM (VKI)	FDP*	†Special Course No.2 on **Fundamentals of Fighter Aircraft Design** *Cours Spécial No.2 sur Les Principes Fondamentaux de la Conception des Avions de Chasse*
24—28 March	FRANCE (Paris)	HQ	60th **National Delegates Board Meeting** 37th **Steering Committee Meeting** (26 March) (NATO Secret) 40th **Panel Chairmen's Meeting** (25—26 March) 16th **National Coordinators' Meeting** (26 March) *60ème Réunion du Conseil des Délégués Nationaux* *37ème Réunion du Comité d'Orientation (26 mars)* *(OTAN Secret)* *40ème Réunion des Présidents de Panel (25—26 mars)* *16ème Réunion des Coordinateurs Nationaux (26 mars)*
7—11 April	FRANCE	FDP	58th Panel Meeting/Symposium on: **Applications of Computational Fluid Dynamics in Aeronautics** and Round Table Discussion on: **Modelling of Time-Variant Flows Using Vortex Dynamics** *58ème Réunion de Panel/Symposium sur: Applications des Calculs de Dynamique des Fluides en Aéronautique, et Table Ronde sur La Modélisation des Ecoulements Fonction du Temps à l'aide de la Dynamique Tourbillonnaire*
13—18 April	NORWAY	SMP	62nd Panel Meeting/Specialists' Meeting on **The Repair of Aircraft Structures Involving Composite Materials** (3 days), and Workshop on **Avionics Corrosion** (1 day) *62ème Réunion de Panel/Réunion de Spécialistes sur: Réparations Impliquant des Composites (3 jours), suivi par un Workshop sur La Corrosion des Systèmes d'Avionique (1 jour)*
14—18 April	CANADA	AMP	Mini-Business Meeting/Symposium on: **Information Management and Decision Making in Advanced Airborne Weapon Systems** *Mini-Réunion de Travail/Symposium sur: Gestion de l'Information et Prise de Décision dans les Systèmes d'Armes Aéroportés de Technologie Avancée*
14—18 April	BELGIUM (VKI)	FDP	Special Course No.1 on **Computation of 3-Dimensional Boundary Layers, with Emphasis on Aircraft, Including Separation** *Cours Spécial No.1 sur le Calcul des Couches Limites Tridimensionnelles, en Particulier sur les Aeronefs, y compris dans le Cas de Décollements*
14—18 April	ITALY	FMP	68th Panel Meeting/Symposium on: **Improvement of Combat Performance of Existing and Future Aircraft** (NATO Secret) *68ème Réunion de Panel/Symposium sur: L'Amélioration des Performances en Combat des Avions Actuels et Futurs (OTAN Secret)*

†This Course will be given as a Short Course in Greece and Turkey.
*The full Panel titles are listed at the end of this Calendar.

Dates *Dates*	Location *Lieu*	Panel *Panel*	Type of Meeting/Subject *Type/Sujet de Réunion*
21—22 April	BELGIUM (Brussels)	EPP	Lecture Series No.145 **Propagation Impact on Modern HF Communications System Design** *Cycle de Conférences No.145* *Impact de la Propagation sur la Conception des Systèmes Modernes de Communication à Haute Fréquence*
24—25 April	FRANCE (Paris — Issy les Moulineaux)		
28—29 April	DENMARK (Copenhagen)		
5—9 May	BELGIUM (Brussels)	GCP	42nd Panel Meeting/Symposium on: **Efficient Conduct of Individual Flights and Air Traffic** *42ème Réunion de Panel/Symposium sur: La Conduite Efficace des Vols Individuels et du Trafic Aérien*
12—16 May	NORWAY (Kongsberg)	AVP	51st Panel Meeting/Symposium on: **Advanced Computer Aids in the Planning and Execution of Air Warfare and Ground Strike Operations** (NATO Secret) *51ème Réunion de Panel/Symposium sur: le Rôle des Ordinateurs dans la Planification et l'Exécution de la Guerre Aérienne et des Opérations d'Attaque au Sol (OTAN Secret)*
19—24 May	USA	PEP	67th Panel Meeting/Symposium on: **Advanced Instrumentation for Propulsion Components** *67ème Réunion de Panel/Symposium sur: Instrumentation Avancée pour Composants de Systèmes Propulsifs*
20—21 May	CANADA (Ottawa)	GCP	Lecture Series No.146 **Application of ADA Higher Order Language to Guidance and Control** *Cycle de Conférences No.146* *Application du Langage Evolué ADA au Guidage et au Pilotage*
2—3 June	UK (London)		
5—6 June	GERMANY (Cologne)		
29—30 May	TURKEY	AVP	Lecture Series No.144 **Interaction between EMP, Lightning and Static Electricity with Aircraft and Missile Avionics Systems** *Cycle de Conférences No.144* *Interaction de l'Impulsion Electromagnétique, de la Foudre et de l'Electricité Statique avec les Systèmes d'Avionique des Aéronefs et des Missiles*
2—3 June	GERMANY (Oberpfaffenhofen)		
5—6 June	NETHERLANDS (The Hague)		
2—6 June	NETHERLANDS (The Hague)	EPP	38th Panel Meeting/Symposium on: **The Aerospace Environment at High Altitudes and its Implications for Spacecraft Charging and Communications** *38ème Réunion de Panel/Symposium sur: L'Environnement Aérospatial aux Altitudes Elevées et ses Implications pour la Charge Electrique des Vaisseaux Spatiaux et les Communications*
3—4 June	USA (St Louis)	PEP	Lecture Series No.148 **Engine-Airframe Integration for Rotorcraft** *Cycle de Conférences No.148* *Intégration Moteur-Cellule pour les Giravions*
9—10 June	ITALY		
12—13 June	FRANCE (Marignane)		
9—11 June	GERMANY	MCS	30th Meeting of the AASC (NATO Secret) *30ème Réunion de l'AASC (OTAN Secret)*

Dates *Dates*	Location *Lieu*	Panel *Panel*	Type of Meeting/Subject *Type/Sujet de Réunion*
8—12 September	USA	FDP	59th Panel Meeting/Symposium on: **Aerodynamic and Related Hydrodynamic Studies using Water Facilities** *59ème Réunion de Panel/Symposium sur: Etudes Aérodynamiques et Hydrodynamiques Apparentées utilisant des Installations Hydrauliques*
8—12 September	CANADA (Ottawa)	EPP	39th Panel Meeting/Symposium on: **Terrestrial Propagation Characteristics in Modern Systems of Communications, Surveillance, Guidance and Control** *39ème Réunion de Panel/Symposium sur: Caractéristiques de la Propagation Terrestre dans les Systèmes Modernes de Communications, de Surveillance, de Guidage et de Pilotage*
8—12 September	GERMANY (Munich)	PEP	68th Panel Meeting/Two Specialists' Meetings on: **(a) Engine Response to Distorted Inflow Conditions** **(b) Transonic and Supersonic Phenomena in Turbomachines** *68ème Réunion de Panel/Deux Réunions de Spécialistes sur:* *(a) Réponse du Moteur aux Conditions de Flux d'Entrée Déformé* *(b) Phénomènes Transsoniques et Supersoniques dans les Turbomachines*
8—12 September	TURKEY	TIP	39th Panel Meeting/Symposium on: **Planning and Designing Effective Defence and Related Information Services** *39ème Réunion de Panel/Symposium sur: Planification et Conception de Services Efficaces d'Information sur la Défense et les Sujets Connexes*
11—12 September	NORWAY (Geilo)	SMP	Lecture Series No.147 **Practical Application of Finite Element Analysis to Aircraft Structural Design** *Cycle de Conférences No.147* *Application Pratique de l'Analyse par Eléments Finis à la Conception Structurale des Aéronefs*
15—16 September	PORTUGAL (Lisbon)		
29—30 September	USA (Sacramento)		
2—3 October	USA (San Antonio)		
6—7 October	USA (WPAFB, Dayton)		
16—20 September	ITALY (Florence)	AVP	52nd Panel Meeting/Symposium on: **Advances in Airborne Electronic Warfare System Design and Development** (NATO Secret) *52ème Réunion de Panel/Symposium sur: Progrès dans la Conception et le Développement des Systèmes Aéroportés Destinés à la Guerre Electronique (OTAN Secret)*
22—26 September	GREECE	NDB	**22nd Annual Meeting** **61st National Delegates Board Meeting** **41st Panel Chairmen's Meeting** (22—23 September) *22ème Réunion Annuelle* *61ème Réunion du Conseil des Delegues Nationaux* *41ème Réunion des Présidents de Panel (22-23 septembre)*

Dates *Dates*	Location *Lieu*	Panel *Panel*	Type of Meeting/Subject *Type/Sujet de Réunion*
28 September– 3 October	GREECE (Athens)	SMP	63rd Panel Meeting/Specialists' Meeting on: **Static Aeroelasticity Effects on High-Performance Aircraft** (3 days) *63ème Réunion de Panel/Réunion de Spécialistes sur: les Effets de l'Aéroélasticité Statique sur les Aéronefs aux Performances Elevées*
6–10 October	UK (London)	GCP	43rd Panel Meeting/Symposium on: **Advances in Guidance and Control Sensor/Seeker/ Estimation/Force Generation Technologies** (NATO Secret) *43ème Réunion de Panel/Symposium sur: Progrès des Technologies dans les Domaines des Capteurs, des Autodirecteurs, de l'Evaluation, et de la Production des Forces (OTAN Secret)*
6–9 October	PORTUGAL	AMP	43rd Panel Meeting/Symposium on: **Biochemical Enhancement of Performance** *43ème Réunion de Panel/Symposium sur: Amélioration des Performances par la Biochimie*
13–17 October	NETHERLANDS (Amsterdam)	FMP	69th Panel Meeting/Symposium on: **Rotorcraft Design for Operations** *69ème Réunion de Panel/Symposium sur: Conception de Giravions Orientés vers les Utilisations Opérationnelles*
13-14 October	NORWAY	EPP	Special Course on **Interaction of Propagation and Digital Transmission Techniques** *Cours Spécial sur l'Interaction de la Propagation et Techniques Digitales de Transmission*
16–17 October	DENMARK		
20–21 October	PORTUGAL		
16–17 October	UK (London)	TIP	Lecture Series No.149 **The Application of Microcomputers to Aerospace and Defence Scientific and Technical Information Work** *Cycle de Conférences No.149* *Application des Micro-ordinateurs a l'Information Scientifique et Technique sur l'Aéronautique, l'Espace et la Défense*
20–21 October	TURKEY		
23–24 October	ITALY		
10–12 November	UK (London)	MCS	31st Meeting of the AASC (NATO Secret) *31ème Réunion de l'AASC (OTAN Secret)*

Full Panel Title

AMP – Aerospace Medical Panel
Panel de Médecine Aérospatiale

AVP – Avionics Panel
Panel d'Avionique

EPP – Electromagnetic Wave Propagation Panel
Panel sur la Propagation des Ondes Electromagnétiques

FMP – Flight Mechanics Panel
Panel de la Mécanique du Vol

FDP – Fluid Dynamics Panel
Panel de la Dynamique des Fluides

GCP – Guidance and Control Panel
Panel de Guidage et Pilotage

PEP – Propulsion and Energetics Panel
Panel de Propulsion et d'Energétique

SMP – Structures and Materials Panel
Panel des Structures et des Matériaux

TIP – Technical Information Panel
Panel de l'Information Technique

MCS – Military Committee Studies (Division)
Etudes pour le Comité Militaire (Division)

HQ – Headquarters
Etat-Major

II – PROGRAMME DESCRIPTIONS

PANELS

CONSULTANT & EXCHANGE PROGRAMME

– INDIVIDUAL CONSULTANTS
– LECTURE SERIES

MILITARY COMMITTEE STUDIES

HEADQUARTERS

AEROSPACE MEDICAL PANEL

Chairman: Air Commodore G.K.M.MAAT, Netherlands
Deputy Chairman: Colonel K.JESSEN, Denmark
Executive: Major L.B.CROWELL, Canada

1986 PROGRAMME

In 1986, the Aerospace Medical Panel will hold two Symposia, sponsor an Aviation Medicine Refresher Course, and implement several training projects with Greece, Portugal and Turkey under the auspices of the AGARD Support to Greece, Portugal and Turkey Programme.

MEETINGS

The Spring Symposium will deal with the topic of "Information Management and Decision-Making in Advanced Airborne Weapon Systems", and will feature a complementary session on "Airborne Voice Interactive Systems" sponsored by the Avionics Panel. This Symposium has also been coordinated with GCP and FMP.

Future aircraft weapon systems will be characterized by a high volume and rate of information exchange, a decrease in time to allocate resources in a demanding environment of multiple threats, realtime threat assessment incorporating both tactical and strategic intelligence, and new sensors coupled with advanced multi-sensor correlation techniques.

The increased capabilities may lead to serious performance decrements unless steps are taken to minimize their impact. The solution to this challenge does not lie only in advanced crew station design incorporating advanced technologies such as adaptive and supervisory systems, and multipurpose displays and computer graphics. However, these techniques, if coupled with improved information management techiques, have the potential to improve system performance significantly.

The promise of enhanced information management is suggested by significant advances in knowledge engineering, artificial intelligence, and decision aiding and support systems. Performance gains have also been realized by applying decision support techniques in some areas; however, these approaches and technologies need to be extended.

This Symposium will focus on the significant human factors issues posed by the development of systems incorporating these new technologies, with emphasis on information management and human-system interactions. The complementary session on "Airborne Voice Interactive Systems" will focus on recent experimental work done in the areas of voice synthesis and recognition and their potential advantages in the cockpit environment.

The Fall Symposium on "Biochemical Enhancement of Performance" will deal mainly with the use of natural biological regulators such as nutrients and regulators of biological rhythms to modify brain function, cognition and behaviour, and the use of pharmaceuticals to enhance performance such as hypnotics, anxiolytics, arousal agents, and other performance enhancing substances.

In modern Air Force systems, the operator is placed in an environment with a great diversity of information being provided at a very fast rate. Human capabilities may be significantly enhanced by modifying, in a reversible way, the operator's ability to perceive and process information, make decisions, and respond appropriately. Full system effectiveness, therefore, may never be achieved. Major scientific advances are now being made in areas dealing with the biochemistry of regulation of neuronal responsiveness. These basic research findings are being exploited by the pharmaceutical industry to develop new performance enhancing drugs with limited side effects and to provide new means for time-release drug delivery to sustain low-level drug activity over longer periods. Biochemical enhancement of performance may also be attained by means of diet modification to provide, for example, needed precursors of neurotransmitters.

This Symposium will range from basic research studies to operational use of biochemicals to enhance performance. This will include natural biological products as well as pharmaceuticals. The effects of nutrients on performance will also be considered.

SHORT COURSE

Subject to final approval by the National Delegates Board at its Fall 1985 Meeting, the Aerospace Medical Panel will sponsor an Aviation Medicine Refresher Course to be conducted at the RAF Institute of Aviation Medicine in Farnborough, UK in the early Fall. This Course will probably be of three days duration and is primarily designed for operational flight surgeons stationed at European NATO air bases where refresher training is not available.

SUPPORT PROGRAMME

The Panel has reviewed and approved several proposals for new projects from Greece, Portugal and Turkey. Greece has proposed the training of a doctor in aviation medicine, one in the techniques of desensitizing aircrew to motion sickness, and one or more technicians in the maintenance of hypobaric chambers. Portugal has proposed the training of doctors in vascular and general surgery and a surgeon in surgical techniques to be used during chemical warfare. Turkey is likely to continue to request the training of doctors and physiologists in aviation physiology.

All projects mentioned above are subject to approval by the National Delegate(s) of the nations requested to provide the training.

MEETING DATES AND LOCATIONS

Mini-Business Meeting/ Symposium	— **Information Management and Decision Making in Advanced Airborne Weapon Systems**	13—18 April 1986 Canada
43rd Panel Meeting/ Symposium	— **Biochemical Enhancement of Performance**	6—9 October 1986 Portugal

PUBLICATIONS

Subject	*Projected Publication Date*
Backache and Back Discomfort Conference Proceedings	January 1986
Summary of: Aircrew Helmets: A Historical Compilation of the Design, Development, Specifications and Protective Performance Aspects AGARDograph (French-text version)	April 1986
Information Management and Decision Making in Advanced Airborne Weapon Systems Conference Proceedings	August 1986
Crash Protection in Passenger-Carrying Aircraft AGARDograph	December 1986
Biochemical Enhancement of Performance Conference Proceedings	1986

AVIONICS PANEL

Chairman: Dr F.I.DIAMOND, US
Deputy Chairman: Dr G.HUNT, UK
Executive: Lt Col M.V.STRATTON, US

PROGRAMME

The Programme consists of two symposia, one Lecture Series, the continuation of one Working Group, and the continuation and initiation of Support to Greece, Portugal and Turkey Programmes.

MEETINGS

The Spring Symposium on "Advanced Computer Aids in the Planning and Execution of Air Warfare and Ground Strike Operations" will consider the advances in and practical application of advanced computer aids in terms of their impact on avionics systems design in both manned and unmanned aircraft and weapons systems and on the total air warfare command and control environment including communications, electronic warfare, intelligence gathering and operational planning. The pace and complexity of modern air warfare are reaching the point where advanced computer aids are becoming essential to assist in the performance of functions that hitherto had been considered the prerogative of aircrews and ground commanders.

Computers are already used extensively in the operation and control of specific types of equipment, such as advanced weapon systems, surveillance radars, electronic warfare and communications systems. However, in the broader context there are still many areas which rely heavily on human decision making and where the use of computers will have considerable impact in the future. New computer architectures promise to facilitate the processing of even greater quantities of data at high speed through the use of techniques such as parallel processing and networking of systems. The increasing use of Artificial Intelligence (AI) techniques, including Intelligent Knowledge Based Systems (IKBS) and Expert Systems will at one extreme allow decision making to be increasingly automated or controlled by non-expert personnel and at the other extreme greatly extend the capabilities of military commanders by presenting information in a timely manner and making rapid assessment of alternative strategies. The successful application of computers should provide improved effectiveness, flexibility and reliability of both men and equipment resulting in a saving of resources and personnel.

There is a great deal of current interest in the general subject of AI and more especially IKBS and Expert Systems and many articles on these subjects have been recently published. However, there seems to be little published work specifically related to the conduct of air warfare and ground strike missions.

The NATO-Secret Symposium will address the following topics: planning and control of operations, avionics systems hardware, sensor integration, expert systems, computer hardware and software and case histories.

The recommendations and conclusions of the October 1985 AVP sponsored Workshop, as they pertain to the theme of this Symposium, could be reported. The AMP and GCP have expressed an interest in participating in this Symposium. SHAPE Technical Centre is actively participating in the preparation of this Symposium.

The Fall Symposium on "Advances in Airborne Electronic Warfare System Design and Development" will have the goals of highlighting NATO airborne electronic warfare (EW) requirements, discussing problem areas in EW design and development, and addressing the status and progress of airborne EW technology. The recent Yom Kippur, Falkland, and Lebanon military conflicts have demonstrated the central role and importance of EW. To an increasing degree, therefore, EW technologies are fundamental in the future combat environment. For both offensive and defensive combat the importance of EW will further increase in order to: improve survivability of suppression systems/air combat vehicles; detect, identify and jam enemy's weapon system effectiveness; reduce vulnerability against enemy EW; and protect against anti-radiation and IR/EO missiles. The growth and diversity of the threats to NATO air forces from updated old systems and new systems such as the SA-10, 11 and 12 or MIG 27/29 constitutes the driving factor for airborne EW systems development. In the following NATO-Secret sessions interaction between representatives of the military, government, academia, and industry will be encouraged; operational requirements and strategies for airborne EW systems; component technologies; passive and active electronic countermeasures equipment; EW system integration; and EW logistic considerations.

This will be the first AGARD attempt to address electronic warfare as the topic of a Symposium. The EW Section of the NATO Defence Support Division will actively participate in the preparation of this Symposium.

LECTURE SERIES

A Lecture Series on the topic of "Interaction Between EMP, Lightning and Static Electricity with Aircraft and Missile Avionics Systems" has resulted from extensive coordination between the AVP and EPP.

WORKING GROUP

WG-12 on "Integration of Avionic Imaging Sensor Signals for Tactical Aircraft" is making progress. Their work will continue through 1986 and an AGARD Report is expected in 1987. Members of the AMP and GCP are participating in this Working Group.

SUPPORT PROGRAMME

The Avionics Panel has the following ongoing Programmes: One with Greece, eight with Portugal, and one with Turkey.

MEETING DATES AND LOCATIONS

51st Panel Meeting/ Symposium	— **Advanced Computer Aids in the Planning and Execution of Air Warfare and Ground Strike Operations** (NATO Secret)	12—16 May 1986 Norway
52nd Panel Meeting/ Symposium	— **Advances in Airborne Electronic Warfare System Design and Development** (NATO Secret)	16—20 September 1986 Italy

PUBLICATIONS

Subject	*Proposed Publication Date*
Multifunction Radar for Airborne Applications Conference Proceedings	February 1986
Multifunction Radar for Airborne Applications Advisory Report	February 1986
The Potential Impact of Developments in Electronic Technology on the Future Conduct of Air Warfare. Workshop Proceedings. Advisory Report	April 1986
Advanced Computer Aids in the Planning and Execution of Air Warfare and Ground Strike Operations Conference Preprints	May 1986
Advances in Airborne Electronic Warfare System Design and Development Conference Preprints	October 1986
Advanced Computer Aids in the Planning and Execution of Air Warfare and Ground Strike Operations Conference Proceedings	October 1986
Advanced Computer Aids in the Planning and Execution of Air Warfare and Ground Strike Operations Conference Proceedings (Classified Supplement)	October 1986
Advanced Computer Aids in the Planning and Execution of Air Warfare and Ground Strike Operations Advisory Report	October 1986

ELECTROMAGNETIC WAVE PROPAGATION PANEL

Chairman: Dr J.H.BLYTHE, UK
Deputy Chairman: Dr H.SOICHER, US
Executive: Lt Col M.V.STRATTON, US

PROGRAMME

The Programme consists of two Symposia, one Lecture Series, one Special Course, the initiation of one Working Group, and continuation of the Support to Greece, Portugal and Turkey Programmes.

MEETINGS

The Spring Symposium on "The Aerospace Environment at High Altitudes and its Implications for Spacecraft Charging and Communications" will examine how the magnetospheric and polar plasmas vary as a result of natural causes and man-made perturbations, and the implications of these variations for the charging and differential charging of spacecraft with their effects, in turn, on spacecraft systems and communications. A further objective will be a discussion of means to achieve operational improvement, including shielding techniques, backup and diversity operation.

Many spacecraft operate at altitudes generally considered above the ionosphere, and more properly considered in the magnetosphere. This is especially true for synchronous altitudes. Whereas, in the ionosphere, the ionization is mostly due to the ionization of the atmosphere by solar ultraviolet radiation, above a few thousand kilometres the background plasma is mostly of solar wind origin, and is much more energetic. As a result, spacecraft can charge to quite high potentials, and differential potentials can be set up between different portions of a spacecraft resulting in the generation of spurious pulses that can interfere with the spacecraft electronics, with spacecraft communications, and can even result in the damage of components by arcing and sparking. In polar latitudes, similar phenomena are seen at even lower altitudes.

It is clear that spacecraft are playing a vital role in our defence systems. There is continuing pressure to increase the sensitivity of the on-board sensors and to push communications to higher bandwidths. This can result in increasing vulnerability to disturbances from natural and man-made perturbations. A major effect results in the charging and differential charging of spacecraft components. A better understanding of these phenomena can help to design spacecraft systems and subsystems to minimize the effects of these disturbances. The following topics, with one classified session, will be covered with the assistance of the AVP: the quiet and disturbed magnetosphere; the polar regions, quiet and disturbed; the natural electromagnetic environment and its variations; spacecraft charging and differential charging mechanisms; effects of man-made perturbations; operational and planned space systems and their vulnerability; system and component characteristics to minimize effects.

The Fall Symposium on "Terrestrial Propagation Characteristics in Modern Systems of Communications, Surveillance, Guidance and Control" will have as objectives the presentation, discussion, and publication of new research results in surface propagation characteristics for modern system applications in relevant frequency ranges (radio to optical frequencies). System examples are tactical communications, target acquisition, terrain-following instrumentation, etc.

Modern system development requires serious attention to the operational environment and variations it experiences due to natural and artificial influences. Applications based on propagation in the vicinity of the earth surface predominantly depend on characteristics of the near-ground propagation medium as well as on its lower boundary, the ground surface, or on the "terrestrial propagation characteristics".

Research work carried out during the last few decades has resulted in data banks and other information on average behaviour of parameters concerned, such as ground profiles, vegetation and electrical characteristics. An efficient operation of modern systems of communication, surveillance, guidance and control requires more and more details of ground data and, particularly, of their deviations from average values on account of anthropogeneous effects in addition to seasonal and diurnal variations.

The main topics that will be covered with AVP assistance are: ground characteristics, profiles, contours and vegetation; near-ground tropospheric interface (incl. modification); diffraction and shadowing effects; refraction and reflection at medium boundaries; measurements, data assembling and processing; applications in communication systems (incl. antenna effects); criteria in surveillance; system aspects in guidance and control. One classified session is anticipated.

LECTURE SERIES

The EPP will sponsor one Lecture Series on the "Propagation Impact on Modern HF Communications System Design". The Lecture Series has been coordinated with the AVP. This Lecture Series will be an update of the highly successful Lecture Series presented in 1983 but will be given at different locations.

SPECIAL COURSE

The EPP will offer a Special Course on the "Interaction of Propagation and Digital Transmission Techniques" based on the results of the EPP Spring 1984 Symposium. Future military radio systems will be increasingly reliant on digital transmissions for security, ECCM features and interaction with computer based systems. The integrity of such radio systems will be dependent on constraints imposed by the medium and it would be timely to review this area and present the current state-of-the-art in the field to the NATO nations. Lectures given in three NATO nations will cover the fundamentals of digital transmission; ELF/VHF systems; LF/MF systems; HF systems; VHF/UHF/SHF LOS systems; VHF/UHF/SHF troposcatter systems; fixed and mobile systems considerations; and identification of R & D areas arising. This Special Course has been coordinated with the AVP.

WORKING GROUP

The EPP will initiate Working Group-02 on "Near Water Propagation Effects and Modern System Adaptation". This Working Group will examine normal and abnormal propagation conditions with the aim of optimizing the performance of modern communication, surveillance, and navigation systems. Special attention will be paid to adaptive measures. The results of this Working Group will be of interest to the NATO Defence Research Study Group on Maritime Operations 2005.

SUPPORT PROGRAMME

The Electromagnetic Wave Propagation Panel has the following ongoing Programmes: one with Greece, two with Portugal, and one with Turkey.

MEETING DATES AND LOCATIONS

38th Panel Meeting/ Symposium	— **The Aerospace Environment at High Altitudes and its Implications for Spacecraft Charging and Communications** (Includes a Classified Session)	2—6 June 1986 Netherlands
39th Panel Meeting/ Symposium	**Terrestrial Propagation Characteristics in Modern Systems of Communications, Surveillance, Guidance and Control** (Includes a Classified Session)	8—12 September 1986 Canada

PUBLICATIONS

Subject	*Proposed Publication Date*
Guided Optical Structures in the Military Environment Conference Proceedings	February 1986
Guided Optical Structures in the Military Environment Advisory Report	February 1986
The Aerospace Environment at High Altitudes and its Implications for Spacecraft Charging and Communications Conference Preprints	May 1986

Terrestrial Propagation Characteristics in Modern Systems of Communications Surveillance, Guidance and Control
Conference Preprints — September 1986

The Aerospace Environment at High Altitudes and its Implications for Spacecraft Charging and Communications
Conference Proceedings — October 1986

The Aerospace Environment at High Altitudes and its Implications for Spacecraft Charging and Communications
Conference Proceedings (Classified Supplement) — October 1986

The Aerospace Environment at High Altitudes and its Implications for Spacecraft Charging and Communications
Advisory Report — October 1986

Interaction of Propagation and Digital Transmission Techniques
Special Course Notes — October 1986

FLIGHT MECHANICS PANEL

Chairman: Dr-Ing. P.HAMEL, Germany
Deputy Chairman: Dr-Ing. A.FILISETTI, Italy
Executive: Mr H.A.TORODE, UK

PROGRAMME

In 1986 the Flight Mechanics Panel will hold two Panel Symposia and will support two Working Groups.

The Panel will continue to support the AGARDograph publications activities sponsored by Working Group 11 (Flight Test Techniques Group).

MEETINGS

The Spring Symposium will be on "Improvement of Combat Performance of Existing and Future Aircraft". The Panel has noted the increasing costs of the procurement and operation of totally new weapons systems and the trend within NATO nations to embody new technologies within existing aircraft to provide enhanced capabilities within an evolving scenario. A situation has developed whereby a large range of technical options are now available to improve, in a highly cost effective manner, the overall combat performance of existing aircraft designs (and that may equally be applicable to new designs). This Symposium will evaluate these technologies in the context of operational needs and requirements. Many of these technologies fall within the fields of other AGARD Panels; AVP, FDP, GCP, PEP and SMP will be offering contributions. Active participation of NATO and national military authorities is also desired and to this end the Symposium will be classified NATO Secret. Topics which are expected to be discussed in detail include: multi-role capabilities; aerodynamic evolution and propulsion integration; conformal weapon carriage; thrust vectoring; integration of new guidance, flight control and weapon systems; improved man-machine interface, survivability, ECM and stealth.

The Fall Symposium will be on "Rotorcraft Design for Operations", a topic which was last reviewed in a symposium in 1977. Since then the expanding role of the helicopter and the intensified threat perceived by potential users have led to proposals for future rotorcraft with characteristics significantly different from existing types. The rapid evolution of rotorcraft configurations, in response to user demands, required a translation into design criteria to permit the aerospace R & D community to provide appropriate and cost effective responses to these demands. The objective of the Symposium is to explore the impact that operational needs are having on the evolution of rotorcraft design. The result should be to provide a review of the present status of rotorcraft design and identify priorities and neglected topics. Three specific issues are central: translation of operational mission requirements into design criteria; the incorporation of defined user needs into methods of test and verification; and the identification of specialised user needs which demand radical design features. The Symposium will be unclassified.

WORKING GROUPS

Working Group 11 (Flight Test Techniques) will continue its activities and expects to publish an AGARDograph entitled "Stores Separation Flight Testing" in 1986. The Group will have nine other AGARDographs in preparation during 1986, all of which have detailed schedules for publication in future years.

Working Group 15 on "Integration of Externally-Carried Weapon Systems with Military Helicopters" will be well under way in 1986. They will be considering recommendations for improvements in analysis and test techniques in order to minimise the operational penalties incurred by the current needs to carry wide varieties of external stores on military helicopters.

The FMP expects to participate actively in the Guidance and Control Panel's WG 09 which will start in 1986. This topic carries considerable common interest in the flight test field.

SUPPORT PROGRAMME

The Panel has now achieved, with the assistance of the AGARD Director, a technically meaningful and acceptable format for a Support Programme to give Portugal an independent Flight Test Capability. This project now involves The Netherlands

and the Federal Republic of Germany as supporting nations. This program will be in its second phase in 1986. The Panel's other support activity for Greece on "Stores Separation Analysis and Flight Testing" supported by Germany will also continue in 1986.

MEETING DATES AND LOCATIONS

68th Panel Meeting/ Symposium	— **Improvement of Combat Performance of Existing and Future Aircraft** (NATO Secret)	14-18 April 1986 Italy
69th Panel Meeting/ Symposium	— **Rotorcraft Design for Operations**	13—17 October 1986 Netherlands

PUBLICATIONS

Subject	*Projected Publication Date*
Flight Simulation Conference Proceedings	March 1986
Flight Simulation Advisory Report	March 1986
Stores Separation Flight Testing (A volume of AGARDograph 300)	August 1986
Improvement of Combat Performance of Existing and Future Aircraft Conference Proceedings	September 1986
Improvement of Combat Performance of Existing and Future Aircraft Advisory Report	September 1986

FLUID DYNAMICS PANEL

Chairman: Dr L.ROBERTS, US
Deputy Chairman: Mr P.W.SACHER, Germany
Executive: Mr R.H.ROLLINS II, US

PROGRAMME

In 1986, the Fluid Dynamics Panel will sponsor two Symposia, two Special Courses, and several publications. A new Working Group was also approved.

MEETINGS

The Spring 1986 Fluid Dynamics Panel 58th meeting will include a Symposium on "Applications of Computational *Fluid Dynamics in* Aeronautics" and a Round Table Discussion on "Modelling of Time-Variant Flows Using Vortex Dynamics".

Computational Fluid Dynamics (CFD) techniques are playing an increasingly important role in both fundamental research and Aeronautical applications, including design and performance prediction. Rapid progress is being made in the NATO nations and it is appropriate for a Symposium to bring the impact of CFD progress into focus for NATO.

The Symposium will concentrate on advances and applications in CFD with emphasis on solutions to the Potential, Euler, and both Reynolds-averaged and full Navier-Stokes equations. Technical sessions will concern design and analysis applications for complex geometries and three-dimensional flow fields and simulation of fundamental flow phenomena. A special session emphasizing computation of viscous-inviscid three-dimensional interactions follows on from the 1984 Round Table Discussion on that topic.

The proposed topic has been coordinated with the FMP, PEP, and SMP.

In conjunction with the Symposium, the Panel plans to hold a Round Table Discussion on "Modelling of Time-Variant Flows Using Vortex Dynamics", a topic which is under consideration for a future Symposium. Several experts will survey developments in this field to aid the Panel in the planning of the meeting.

The Fall 1986 Fluid Dynamics Panel 59th Meeting will include a Symposium on "Aerodynamic and Related Hydrodynamic Studies Using Water Facilities".

In recent years there has been an increasing use of water facilties for aerodynamic investigations. These include water tunnels, towing channels and stationary tanks. The main thrust has been in the application of flow visualization techniques for recognizing and solving difficult flow problems in both external and internal aerodynamics. Examples include flow fields around fighter aircraft, inlet flows, recirculating flow patterns associated with VTOL, ramjet simulation, etc, and, in general, three dimensional flows with vortices or separated regimes. Water is more effective than air for flow visualization because of its lower diffusivity. There are a number of modern developments which will make water facilities even more effective and productive. These include laser-doppler velocimetry, laser-induced fluorescence, computer aided particle tracking, and digital image processing which are well suited to the lower speeds and higher densities of water.

The time is appropriate for a Symposium at which experiences, results and future prospects for this medium can be discussed, with representation from the hydrodynamics and naval engineering as well as the aeronautical communities so that related problems in fluid dynamics may be exchanged. These include 3-D flow problems as in fuselage and hull flows; boundary layer problems including roughness, turbulence and scale effects; separated flows, shear layers, jets and wakes; lifting and control surfaces, active controls; and propellers. Experimental, theoretical and computational techniques and results will be covered.

The topic has been coordinated with the FMP, PEP, and SMP.

SPECIAL COURSES

The Panel will sponsore two Special Courses with the cooperation of the von Kármán Institute in the series of such presentations made by the Institute annually.

The first course on "Computation of 3-Dimensional Boundary Layers with Emphasis on Aircraft, Including Separation", will be presented at the VKI and be directed by M.Cousteix of France.

The second course, on "Fundamentals of Fighter Aircraft Design", will also be presented at the VKI with shorter presentations made in Greece and Turkey as Short Courses. This course will be directed by Mr P.W.Sacher, of Germany.

WORKING GROUPS

The work of FDP/WG.09 on "Boundary Layer Simulation and Control in Wind Tunnels" will be completed in 1986 and an Advisory Report on the results of the effort will be prepared.

The Panel will have implemented, in 1985, FDP/WG.10 on "3-D Viscous Flows — Boundary Layer Limit". The objective of this working group will be to establish the range of validity of the 3-D boundary layer equations to predict viscous flow over lifting bodies and wings at subsonic, transonic and subsonic Mach numbers.

SUPPORT PROGRAMME

The Panel has reviewed several proposals for new cooperative projects and is initiating work on one approved by Portugal and Belgium on "Performance Characteristics of Propeller/Turbine Rotors". Another Portuguese proposal and two Turkish proposals were reviewed and will be supported by the Panel if approved by participating Nations.

PUBLICATIONS

The Panel will prepare, during 1986, several publications previously approved as well as the Lecture Notes for its two proposed Special Courses. Initial effort on an AGARDograph on "Complex Turbulent Flows", originally approved for 1985, has been postponed and will be initiated in 1986.

MEETING DATES AND LOCATIONS

58th Panel Meeting/ Symposium	— **Applications of Computational Fluid Dynamics in Aeronautics** and Round Table Discussion on **Modelling of Time-Variant Flows using Vortex Dynamics**	7—11 April 1986 France
59th Panel Meeting/ Symposium	— **Aerodynamic and Related Hydrodynamic Studies using Water Facilities**	8—12 September 1986 United States

PUBLICATIONS

Subject	*Projected Publication Date*
Store Airframe Aerodynamics Advisory Report	February 1986
Fundamentals of Fighter Aircraft Design Special Course Notes	February 1986
Flow Visualization Techniques and Interpretation AGARDograph	February 1986
Computation of 3-Dimensional Boundary Layers with Emphasis on Aircraft, Including Separation Special Course Notes	April 1986

Applications of Computational Fluid Dynamics in Aeronautics Confrence Preprints	April 1986
Reynolds Number Effects in Transonic Flows AGARDograph	July 1986
Report of WG.09 on Boundary Layer Simulation and Control in Wind Tunnels Advisory Report	ugust 1986
Applications of Computational Fluid Dynamics in Aeronautics Conference Proceedings	August 1986
Applications of Computational Fluid Dynamics in Aeronautics Advisory Report	ugust 1986
Aerodynamic and Related Hydrodynamic Studies using Water Facilities Conference Preprints	September 1986
Modelling of Time-Variant Flows using Vortex Dynamics Report	October 1986
Aerodynamic and Related Hydrodynamic Studies using Water Facilities Conference Proceedings	1987
Aerodynamic and Related Hydrodynamic Studies using Water Facilities Advisory Report	1987
Complex Turbulent Flows AGARDograph	1987

GUIDANCE AND CONTROL PANEL

Chairman: Dr Ing. R.C.ONKEN, Germany
Deputy Chairman: Mr K.A.PEEBLES, Canada
Executive: Lt Col P.CARRE, France

PROGRAMME

The Programme consists mainly of two symposia, the publication of an AGARDograph, one Lecture Series and two new Working Groups.

The Spring Symposium will be on the topic "Efficient Conduct of Individual Flights and Air Traffic".

This Symposium will cover in particular the integration aspects of advanced concepts with respect to various users (civilian/military) requirements (economy, integrity, security) and control procedures to meet overall economy and increase the probability of mission achievement for military aircraft (training and battlefield). In view of present developments in guidance and control, navigation, communications, surveillance and particularly in processing technologies, it is essential to revise the conduct of flight and control of air traffic, placing the emphasis on the integration of the multiple components involved.

Coordination is being effected with AMP and AVP.

The Fall Symposium will deal with "Advances in Guidance and Control Sensor/Seeker/Estimation/Force Generation Technologies".

As a follow-up of previous activities on sensor estimation technologies, this symposium will centre on a broad area of techniques ranging from target seekers, inertial, air data, flow control, estimation methods and force and moment generating technology all of which are an integral part of guidance and control technology.

Coordination is being effected with the AVP and the symposium is expected to be classified.

The Panel will publish one AGARDograph on "Computation, Prediction and Control of Aircraft Trajectories" prepared and approved in 1985.

The Panel will also sponsor one Lecture Series on "Application of ADA Higher-Order Language (HOL) to Guidance and Control".

This Lecture Series on ADA will cover the basic structures, theories and principles embodied in this Higher Order Language to Guidance and Control.

WORKING GROUPS

The Panel will launch two new working groups:

The first, GCP/WG.09, is on "Test and Qualification Technology for Flight Critical Control Systems".

The objective of this working group is to analyse the various approaches to test and qualification techniques that have proved successful in actual flight programmes and the deficiencies in the technology that become apparent through such programmes.

The second, GCP/WG.10, will cover "Application Software Generator Technology for Guidance and Control Systems".

Considerable interest has been expressed on advances in software generator technology; therefore, it seems timely to organise a working group which will study the impact of this new technology on guidance and control systems.

MEETING DATES AND LOCATIONS

42nd Panel Meeting/ Symposium	— **Efficient Conduct of Individual Flights and Air Traffic**	5—9 May 1986 Belgium
43rd Panel Meeting/ Symposium	— **Advances in Guidance & Control Sensor/Seeker/Estimation/Force Generation Technologies** (Classified)	6—10 October 1986 United Kingdom

PUBLICATIONS

Subject	*Projected Publication Date*
Improved Guidance and Control Automation at the Man-Machine Interface (GCP/WG.07) Advisory Report	June 1986
Efficient Conduct of Individual Flights and Air Traffic Conference Proceedings	July 1986
Efficient Conduct of Individual Flights and Air Traffic Advisory Report	July 1986
The Implications of Using Integrated Software Support Environment for Design of Guidance and Control Systems Software (GCP/WG.08) Advisory Report	August 1986
Computation, Prediction and Control of Aircraft Trajectories AGARDograph	October 1986
Advances in Guidance and Control Sensor/Seeker/Estimation/Force-Generation Technologies Conference Procedings and Classified Supplement	December 1986
Advances in Guidance and Control Sensor/Seeker/Estimation/Force-Generation Technologies Advisory Report	December 1986

PROPULSION AND ENERGETICS PANEL

Chairman: Prof. H.WITTENBERG, Netherlands
Deputy Chairman: Dr W.MACMILLAN, Canada
Executive: Dr E.RIESTER, Germany

PROGRAMME

The Propulsion and Energetics Panel programme is mainly concerned with gas turbine engines. While in the Spring Symposium on "Advanced Instrumentation for Propulsion Components" the turbine engine community and the rocket experts are equally interested, both the Fall Specialists' Meetings, on "Engine Response to Distorted Inflow Conditions" and on "Transonic and Supersonic Phenomena in Turbomachines", are restricted to aero engines.

The Panel will continue with Working Group 15 on "Uniform Engine Testing Programme" and Working Group 18 on "Test Cases for Computation of Internal Flows in Aero Engine Components". Two new Working Groups are approved to start with full effort in 1986:

- "Standards for Instrumentation of Aircraft Turbine Engines and Components under Development", and
- "Development and Application of Life Assessment Technology".

The Panel will sponsor a Lecture Series on "Engine-Airframe Integration for Rotorcraft". The AGARDographs "Manual for Aeroelasticity in Turbomachines" and "Altitude Rocket Test Facility Register" will be completed in 1986, while the AGARDograph on "Hazard Studies for Solid Propellant Rocket Motors" will be continued in 1987. A new AGARDograph on "Transmission Systems for Power Transfer in Helicopters and Turboprops will start in 1986.

In addition, the Panel will support some 1986 activities of other Panels:

- FMP Spring Meeting on "Improvement of Combat Performance for Existing and Future Aircraft"
- FDP Spring Meeting on "Fundamentals and Applications of Computational Fluid Dynamics in Aeronautics".

MEETINGS

The Spring Symposium will deal with "Advanced Instrumentation for Propulsion Components (Gas Turbines and Rockets)". Since a large portion of instrumentation can be applied to all kinds of propulsion components, this Symposium will be addressed to research scientists and development engineers from both the aero engine and the rocket communities to discuss the state-of-the-art and to be informed on new possibilities of measurements. The programme will include CARS, laser anemometry, pyrometry, clearance measurements including X-ray, high speed data acquisition and processing, stress measurements and vibration and thin layer techniques, unsteady and transient phenomena, and future prospects. The Symposium will be organized in sessions followed by long discussion periods in order to exchange experience in detail. The sessions will be carefully prepared by highly qualified chairmen, and the discussions will be edited and published by specially selected 'rapporteurs'. There is no overlap with PEP Lecture Series 132 which dealt with less sophisticated techniques applied to complete engines.

In Fall, the Panel will hold two Specialists' Meetings. The subject of the first is "Engine Response to Distorted Inflow Conditions". The topic was intensively discussed with FDP because the external aerodynamics produce the distortions the engine has to cope with. Consequently, FDP is prepared to provide one or more papers, especially on computational techniques for intake flows. The scope will include: review of current knowledge on engine response to distorted inflow condition, validation of unsteady flow and empirical distortion parameters, engine and compressor performance prediction methods for distorted inflow, distorted inflow detection and experimental techniques for signature simulation, experimental investigation of engine instability due to inflow distortions. The meeting might result in information on acceptable inflow distortion parameters to be applied for airframe intake integration.

The second Specialists' Meeting will be concerned with "Transonic and Supersonic Phenomena in Turbomachines". This subject was also discussed with FDP who agreed to support it. Increase in speed is a promising possibility for improving the performance of turbine engines. Therefore, the Panel has had the topic under consideration for some time. It now expects that, by 1986, sufficient interesting contributions will be forthcoming from various countries to constitute a worthwhile review of the subject. The scope will include: experimental data on shock structures, shock induced losses including shock boundary layer interactions, computational results, and blade design methods. The meeting will offer a forum for highly qualified specialists' to discuss their views and the latest results of their investigations, and for development engineers to be informed on the state-of-the-art.

LECTURE SERIES

The Propulsion and Energetics Panel will sponsor a Lecture Series on "Airframe Engine Integration for Rotorcraft". This subject was coordinated with FDP, FMP and GCP. These Panels offer contributions on installation effects, handling quality requirements, and dynamics/interaction/control options respectively.

WORKING GROUPS

WG 15 "Uniform Engine Testing Programme" will have completed all the test runs in 1985, but needs two more years for the evaluation of the facility results and for the preparation and discussion of the final report. The reasons for the delay are as follows:

- There was a fault in the tests at RAE, with the engine having to be sent back to the US.
- After the original schedule was disturbed it was difficult to find windows in the facilities' schedules, as the test engines were tested everywhere in the best cell.
- An additional repeat test in Canada is advisable.
- The evaluation of facility test results takes much longer than estimated.

The Working Group is extended to 1987.

WG 18 on "Test Cases for Computation of Internal Flows in Aero Engine Components" will be in its main working phase.

A new Working Group is approved: WG 19 on "Recommended Practices for Instrumentation of Aircraft Turbine Engines and Components under Development" will fill the gap between the more basic level Lecture Series 132, held in 1984, and the Spring Symposium concerned with highly sophisticated instrumentation beyond the standards. WG 19 should develop a set of minimum practices for instrumentation installation enabling procurement agencies and manufacturers to achieve reliable test results within a known tolerance regime at minimum cost.

AGARDOGRAPHS

The Panel will prepare a new AGARDograph on "Transmission Systems for Power Transfer in Helicopters and Turboprops" which is intended to fill the gaps left from the Fall 1984 Symposium in order to enable the designer to incorporate new technologies in his projects with a limited number of testing hours. The gaps are listed in detail in the Technical Evaluation Report of the Symposium.

SUPPORT PROGRAMME

In 1986, PEP will be involved in five projects with Greece and Turkey, already approved. Four other existing projects with Portugal and Turkey might be extended into 1986, and several others are in preparation.

MEETING DATES AND LOCATIONS

67th Spring Panel Meeting/Symposium	— **Advanced Instrumentation for Propulsion Components (Gas Turbines and Rockets)**	19—24 May 1986 US
68th Fall Panel Meeting/Specialists' Meetings	— **A — Engine Response to Distorted Inflow Conditions** **B — Transonic and Supersonic Phenomena in Turbomachines**	8—12 September 1986 Germany

PUBLICATIONS

Subject	*Projected Publication Date*
Evaluation of Measurements in Flames AGARDograph	March 1986
Smokeless Propellants Conference Proceedings	March 1986
Smokeless Propellants Conference Proceedings (Classified Supplement)	March 1986
Interior Ballistics of Guns Conference Proceedings	March 1986
Interior Ballistics of Guns Conference Proceedings (Classified Supplement)	March 1986
Advanced Instrumentation for Propulsion Components Conference Preprints	May 1986
Altitude Rocket Test Facility Register AGARDograph	May 1986
Performance of Rocket Motors with Metallized Propellants WG 17 Advisory Report	June 1986
Engine Response to Distorted Inflow Conditions Conference Preprints	September 1986
Transonic and Supersonic Phenomena in Turbomachines Conference Preprints	September 1986
Advanced Instrumentation for Propulsion Components Conference Proceedings	October 1986
Manual for Aeroelasticity in Turbomachines AGARDograph	December 1986

STRUCTURES AND MATERIALS PANEL

Chairman: Mr W.G.HEATH, UK
Deputy Chairman: Prof P.SANTINI, Italy
Executive: Mr D.A.DRANE, UK

PROGRAMME

The programme consists of two Specialists' Meetings, one Lecture Series, one Workshop, and the completion of two major publications. In addition, the Panel will sustain the activities of three Working Groups, coordinate three Cooperative Programmes and continue technical supervision of the AGARD-SMP collaborative research projects with Greece, Portugal and Turkey.

MEETINGS

The Spring 1986 Specialists' Meeting will deal with "The Repair of Aircraft Structures Involving Composite Materials". Analysis of historic data indicates that aircraft battle-damage repair has a significant influence on sortie-surge capabilities, more especially in the initial stages of a conflict; information so far available has shown up requirements for a wide range of data and procedures, particularly in the field of rapid repair. As well as assessing the merits of current repair techniques, the Panel is confident that the need for data and information amongst the NATO Nations is so great that all countries will benefit from an exchange of the kind proposed. An expansion of the present data base (to include practical experiences), the development of innovative repair techniques and the recommendation of lines of materials development are the major objectives of this Specialists' Meeting. In addition to the use of composite "patches" for metal airframes, the rapidly increasing number of applications of organic composites systems in NATO aerospace structures has highlighted a need to develop repair procedures appropriate to these novel configurations.

Also at the Spring Meeting the Panel plans to hold a one-day Workshop on "Avionics Corrosion". This subject, which has previously attracted little attention, is now becoming a matter of major concern. Trial studies on new corrosion control practices and on the use of novel materials have proved highly successful and, in the Panel's view, a Workshop to review developments and exchange data on corrosion control in avionics would prove very rewarding. It is already evident that an inter-disciplinary approach will be required, and the Avionics Panel has appointed a representative to put the Avionics view. This Activity has been coordinated with the Avionics Panel.

The Specialists' Meeting in the Fall will address the problems of "Static Aeroelasticity Effects on High-Performance Aircraft". Modern designs tend to employ very thin airfoils having a degree of stiffness which is sometimes well below the ideal (resulting in, for example, lower than adequate control effectiveness and manoeuvrability); the conventional means of increasing stiffness by thickening the wing skin may not be cost-effective. In addition, the introduction of the highly forward-swept-wing planform poses a static aeroelastic stability problem of fundamental importance.

These effects are felt at model as well as full-scale; it is hoped not only to review modern tools for structural and aeroelastic analysis (e.g., the use of aeroelastic tailoring, large-scale structural modelling and optimisation) but also to see how they can be successfully applied. The intention in holding the meeting is to provide both a forum for the exchange of information on recent progress in the use of novel techniques and a means by which the development of modern high-performance aircraft of the NATO countries may benefit. The Panel plans to publish the proceedings of the meeting and to make recommendations. This activity has been coordinated with the Fluid Dynamics Panel.

LECTURE SERIES

A proposal for a Lecture Series on the topic "Practical Applications of Finite Element Methods to Aircraft Structural Design" has aroused considerable interest ; a number of NATO nations has asked to host the proposed series.

WORKING GROUPS

The Panel will support three Working Groups during the year. Working Group 22 on "Aircraft Design Requirements for Operation on Damaged and Repaired Runways" had intended to complete the bulk of its work by the Fall of 1985, but will now require to hold one meeting in 1986 to review the final draft of its Report before publication.

Working Group 23, producing an "AGARD Handbook of Advanced Casting", is also scheduled to complete the bulk of its work in 1985, but proposes one meeting in 1986 to review the final draft Report before publication.

Working Group 24 is a short-term activity which aims to define configurations for "Standard Mechanical Joint Test Specimens". The experimental phase of this activity will end in 1985, but one further meeting is proposed for the Spring of 1986 to review the draft Report.

SUPPORT PROGRAMME

The Panel will complete its Cooperative Programme on "Fatigue in Aircraft Corrosion Testing (FACT)"; it is intended to approve its final draft in the Winter of 1985 and publish in 1986.

The Panel will continue with its Cooperative Programme on "Research for Short Crack Effects", the plan is to complete the work during the year and publish a report in the Winter of 1986.

The Panel is considering an extension to its existing "Cooperative Test Programme on Engine Disc Material"; a final decision will be taken in mid 1985.

A further Cooperative Research Programme of testing is under consideration for the study of "Mechanically Fastened Joints in Composites". The activity is likely to lead to a coordinated fatigue testing programme.

The Panel continues to monitor those activities under the AGARD Support to Nations Programme which fall within its purview. Since this Programme is now well established, the monitoring function is now exercised by a Panel Standing Committee. It is intended that reports resulting from at least some of the work done in this programme will be published in appropriate journals.

MEETING DATES AND LOCATIONS

62nd Panel Meeting/ Specialists' Meeting	— **The Repair of Aircraft Structures Involving Composite Materials** and Workshop on **Avionics Corrosion**	13—18 April 1986 Norway
63rd Panel Meeting/ Specialists' Meeting	— **Static Aeroelasticity Effects on High Performance Aircraft**	28 September—3 October

PUBLICATIONS

Subject	*Projected Publication Date*
Fatigue in Aircraft Corrosion Testing Report	July 1986
Standard Mechanical Joint Test Specimens Report	July 1986
Repair of Aircraft Structures Involving Composite Materials Conference Proceedings	August 1986
Avionics Corrosion Report	August 1986
AGARD Handbook of Advanced Casting Handbook	August 1986
Handbook of Corrosion, Vol.II AGARDograph	September 1986
Design Requirements for Operation on Damaged and Repaired Runways Report	September 1986

Static Aeroelastic Effects on High Performance Aircraft
Conference Proceedings — December 1986

Research for Short Crack Effects
Report — December 1986

TECHNICAL INFORMATION PANEL

Chairman: Mr G.TITTLBACH, FRG
Deputy Chairman: Miss N.M.WILDGOOSE, Canada
Executive: Mr G.W.HART, NATO

PROGRAMME

The programme consists of one Specialists' Meeting, one Lecture Series, and the publication programme itemised below.

In addition, the Panel will continue with the implementation of two cooperative research projects, one with Greece and one with Turkey.

MEETING

The 1986 Specialists' Meeting deals with "Planning and Designing Effective Defence and Related Information Services". This responds to a proposal from the host nation, Turkey. The focus of the meeting will be on:

- the benefits of scientific and technical information services
- how to define user requirements
- resources required to operate a centre
- methods used to store, handle, and retrieve information
- access to other information sources, such as national and international networks.

LECTURE SERIES

A Lecture Series is proposed on the highly topical subject of "The Application of Microcomputers to Aerospace and Defence Scientific and Technical Information Work". This is a follow-up to LS-92, held in 1978, which (significantly) addressed the subject of *mini*computers in the same context.

PUBLICATIONS

Scheduled to be published this year is the TIP Report entitled "Guide to Aerospace and Defence Technical Reports Series in NATO Countries" which identifies in detail a wide range of series of scientific and technical reports, enabling users to find out what series exist, what they cover, where they can be obtained, what are the distribution limitations, etc. The Guide is a major work, having been in preparation for the last five years. A new volume, in the AGARD Index of Publications, covering the years 1983—85, is also included in the programme.

SUPPORT PROGRAMME

The Panel has two tasks under this Programme. Both concern the setting up of Defence Information Centres, one in the Hellenic Air Force Air Training Command, the other in MOD Headquarters in Ankara. The first is planned to be completed this year. Work on the second is continuing.

MEETING DATES AND LOCATIONS

39th Panel Meeting/ Specialists' Meeting	**— Planning and Designing Effective Defence and Related Information Services**	**8—12 September 1986 Turkey**

PUBLICATIONS

Subject	*Projected Publication Date*
Guide to Aerospace and Defence Technical Reports Series in NATO Countries Report	January 1986
Index of AGARD Publications 1983—1985	April 1986
Report Writing Guide Report	June 1986
Planning and Designing Effective Defence and Related Information Services Conference Preprints	August 1986
Planning and Designing Effective Defence and Related Information Services Conference Proceedings	December 1986

CONSULTANT AND EXCHANGE PROGRAMME

Chief, Plans and Programmes: Mr C.E.BORGEAUD
Deputy, Plans and Programmes: Mr G.ALEXIS

The Consultant and Exchange Programme was established in order to respond to requests made by the Nations and to complement Panel activities in establishing contacts between aerospace scientists and engineers in areas not always covered by the Panels.

This Programme uses several methods to carry out its mission: individual consultants, exchange of scientists, and Lecture Series.

INDIVIDUAL CONSULTANTS AND EXCHANGE OF SCIENTISTS

Individual consultants are specifically requested by the National Delegates of the nations concerned.

Individual consultants are also made available to support various AGARD and NATO activities. Panels or Panel members may request individual consultants' expertise, visits and lectures by individuals or by teams of experts (Short or Special Courses) for carrying out part of their programme. Panels, Working Groups and the AASC also make use of individual consultants to support specific projects.

This programme also facilitates arrangements for the exchange of scientists between research establishments or between nations, or an exchange of equipment between laboratories.

In 1986 this programme will support three Special Courses:

Panel	*Type of Special Course*	*Planned Location*
FDP No.1	**Computation of 3-Dimensional Boundary Layers, with Emphasis on Aircraft, including Separation** Course Director: Mr J.Cousteix (FR)	Belgium (VKI) 14—18 April 1986
FDP No.2	**Fundamentals of Fighter Aircraft Design** Course Director: Mr P.W.Sacher (GE)	Belgium (VKI) 17—21 February 1986 (and Greece & Turkey as a Short Course)
EPP	**Interaction of Propagation and Digital Transmission Techniques** Course Director: Dr M.Darnell (UK)	

LECTURE SERIES

The popularity of this programme continues to be demonstrated, as many requests are received from the NATO nations for presentations. The Panels also have generated considerable interest, resulting in ten Lecture Series being proposed for the 1986 Programme. Based on the guidance given by the National Delegates Board, and on the accepted level of effort to be maintained, it is considered normal that six Lecture Series should be given a year (each Lecture Series being presented for two days in three different locations). Therefore, six Lecture Series were selected from a list of ten proposed by the Panels.

The 1986 Lectures Series are described in the following text.

The budget proposed for 1986 includes the printing of the Lecture Series publications as well as the preparation of the Lecture Series, also travel, subsistence allowance and honoraria, when appropriate, for participating speakers.

Lecture Series No.144 (AVP)	**INTERACTION BETWEEN EMP, LIGHTNING, AND STATIC ELECTRICITY WITH AIRCRAFT AND MISSILE AVIONICS SYSTEMS**	**May and June 1986 Netherlands/Germany/Turkey**

This Lecture Series is of interest to NATO, and particularly to AGARD, because of the continuing dependence on aircraft and missile avionics systems. As the vulnerability of solid-state devices to EMP, lightning, and spark discharges increases, the susceptibility of LSI components and microprocessors also increases. Use of fibre optics introduces a new component with less susceptibility to these phenomena. Composite materials on aircraft may be more vulnerable to lightning and EMP because there are fewer metal conducting paths available.

Topics to be discussed:

— introduction of lightning, EMP and static electricity

— EMP simulation and testing
— shielding against EMP induced currents and voltages
— coupling of EMP induced currents and voltages with aircraft and missile avionics systems
— EMP sensors
— effects of composite materials, fibre optics, dielectric waveguides, and similar materials on EMP and lightning
— lightning simulation and testing
— shielding against lightning-induced currents and voltages
— coupling of lightning-induced currents and voltages with aircraft and missile avionics systems
— lightning sensors
— topological mapping for detection of static electricity shielding against build-up
— shielding against static electricity

A round-table discussion will be held at the end of each presentation.

Lecture Series Director: Prof. A.W.Biggs (US)

Lecture Series 145	PROPAGATION IMPACT ON MODERN HF	April 1986
(EPP)	*COMMUNICATIONS SYSTEM DESIGN*	Belgium/Denmark/France

This Lecture Series is of interest to NATO, and particularly to AGARD because HF communications is a primary and backup system of communications within the Alliance.

The ionosphere can be considered as an electronic component of HF communication systems. Ionospheric propagation impacts on all of the electronics, as well as on the coding and modulation methods. The resulting components of HF Communications now being developed will be the subjects of the Lecture Series.

Topics to be covered:

The aim of these lectures is to survey problems and progress in the field of HF communications. They will cover the needs of both civil and military communications for high-frequency communications and will discuss concepts of real-time channel evaluation, system design, as well as advances in equipment, in propagation, and in coding and modulation techniques. The lectures aim to bring specialists in this field up to date so that HF communications can be considered as a viable technique. The problems, difficulties and limitations of HF will also be outlined.

A round-table discussion will be held at the end of each presentation.

Lecture Series Director: Dr J.Aarons (US)

(The lecturers will be the same as those who took part in the 1983 Lecture Series on "Modern HF Communications" given in Greece, Italy and the USA.)

Lecture Series No.146	APPLICATION OF ADA HIGHER-ORDER	May 1986
(GCP)	LANGUAGE TO GUIDANCE AND CONTROL	Canada/Germany/UK

In view of the intention to make ADA a NATO Standard Higher-Order Language (HOL) this Lecture Series will explain the basic structure, theories and principles embodied in ADA.

Tentative topical outline:

— introduction and review of ADA
— ADA language structure
— program writing and editing
— compiler technique
— validation techniques
— case studies

A round-table discussion will be held at the end of each presentation.

Lecture Series Director: Dr T.F.Westirmeier (US)

Lecture Series No.147	PRACTICAL APPLICATIONS OF FINITE ELEMENT	September and October 1986
(SMP)	ANALYSIS TO AIRCRAFT STRUCTURAL DESIGN	Norway/Portugal/US

Finite Element Analysis methods are by now broadly known and fairly widely applied. What are not so well established are the techniques of applying these methods to the day to day problems encountered in the Aerospace industries. The Lecture Series will address itself to these aspects and endeavour to illustrate problems by calling on the practical experience of users.

Topics:

— background to the subject (as a refresher or, if necessary, an introduction).
— basic concepts of stiffness matrices — solution of problems
— relevant rules of thumb — practical considerations in defining a model
— questions to consider in discussions with a bureau — what makes a good element, what integration rules are sensible, how to interpret results and what accuracy has been achieved
— practical problems — discussion in detail of actual problems. What went wrong — how to get out of trouble
— system implementation. Comparison (not evaluation) of major system. Factual examination of differences.

A round-table discussion will be held at the end of each presentation.

Lecture Series Director: Dr A.J.Morris (UK)

Lecture Series No.148 (PEP)	ENGINE-AIRFRAME INTEGRATION FOR ROTORCRAFT	June 1986 US/Italy/France

Recently most attention has been given to fixed-wing, high-speed and STOL aircraft, with little specialization on rotorcraft. The objective of the Lecture Series is to produce the equivalent of a handbook for use by propulsion and airframe people to enhance interfaces, coordination, and understanding of system design integration.

The Lecture Series will be supported by FMP, FDP and GCP.

Scope:

1. Engine Sizing/Power Matching
   - mission of vehicle
   - single versus twin engine installation
   - one engine inoperative case
   - altitude/hot day influence
   - lapse rate
   - engine ratings
2. System Integration
   - dynamics and interactions
   - control options
   - inlets (protection against FDO, icing, distortion effects)
   - transmission matching
3. Vehicle Performance
   - influence of engine variables (weight, specific fuel consumption throughout flight envelope, engine output revolutions per minute, free turbine versus fixed)
   - influence of other engine options (reciprocating versus turboshaft)
   - cost trade-off methodology
   - single versus multiple engines
   - aircraft preliminary design
4. System Specifications and Qualifications
   - development steps (engines, transmissions, controls)
   - time required for qualification.

A round-table discussion will be held at the end of each presentation.

Lecture Series Director: Mr V.R.Edwards (US)

Lecture Series No.149 (TIP)	THE APPLICATION OF MICROCOMPUTERS TO AEROSPACE AND DEFENCE SCIENTIFIC AND TECHNICAL INFORMATION WORK	October 1986 UK/Turkey/Italy

TIP Lecture Series No.92, held in 1978, dealt with this same subject but in relation to minicomputers, not microcomputers. The cost of computing is much less now than it was then. Moreover, extremely cheap microcomputers have proliferated and can now take on some of the tasks that required minicomputers six years ago. Hence the requirement for this new Lecture Series.

Topics to be covered will probably include:

- purchase of periodicals and books (e.g., ordering, chasing, accounts);
- data preparation (possible for direct input to a main-frame system);
- production of accessions lists, catalogues, etc;
- thesaurus management;
- selective dissemination of information;
- preparation and updating of standard distribution lists and lists of borrowers, publishers etc.

Following consideration of the tasks to be undertaken by the microcomputer, attention will be given to the various features to look for in selecting and purchasing suitable equipment.

A round-table discussion will be held at the end of each presentation.

Lecture Series Director: Dr J.H.Ashford (UK)

LECTURE SERIES PUBLICATIONS – 1986

Lectures Series No.	*Panel*	*Title*	*Projected Publication Date*
LS 144	AVP	Interaction between EMP, Lightning and Static Electricity with Aircraft and Missile Avionics Systems	May
LS 145	EPP	Propagation Impact on Modern HF Communications System Design	March
LS 146	GCP	Application of ADA Higher Order Language to Guidance and Control	April
LS 147	SMP	Practical Application of Finite Element Analysis to Aircraft Structural Design	August
LS 148	PEP	Engine-Airframe Integration for Rotorcraft	May
LS 149	TIP	The Application of Microcomputers to Aerospace and Defence Scientific and Technical Information Work	September

SUPPORT PROGRAMME TO GREECE, PORTUGAL AND TURKEY – 1986

Maintaining a National Delegates Board decision, this programme covers the support of panel members' attendance at AGARD Panel meetings (formerly called "Support to Nations") and the support of projects undertaken by Greece, Portugal and Turkey in collaboration with other nations in the Alliance (formerly called "Additional Support to Greece, Portugal and Turkey").

For 1986 funding will remain at the 1985 level, based on the guidance provided by the National Delegates Board in September 1984.

SUPPORT OF PANEL MEMBERS

In 1986, the plan is to support the attendance at AGARD Panel meetings of a large number of Panel members from Greece, Portugal and Turkey. As in 1985, this support will provide travel funds and subsistence allowance for those Panel members who are unable to be funded by their respective nations. The detailed list of supported Panel members will be established after receipt of all the requests from Greece, Portugal and Turkey.

SUPPORT OF COLLABORATIVE PROJECTS

The support of collaborative projects began in 1981 with a funding of 500,000 French francs, and was subsequently increased in real terms by 250,000 French francs in both 1982 and 1983. The allowance for inflation brought the funding level in 1983 to 1.350 million French francs; and a new increase of 300,000 French francs in 1984 brought the total funding request to 1.65 million French francs. (Support to Panel members included.) With inflation added in accordance with guidance provided by the Financial Controller, the total funds proposed were 1.878 French francs in 1984. The Military Budget Committee reduced this to 1.778 million French francs. For 1985, the total funds proposed were 1.878 million French francs and the Military Budget Committee gave its approval for 2.141 million FF.

The List of Collaborative Projects for Support to Greece, Portugal and Turkey (which includes all the Active Projects in actual operation, all the Projects still pending but expected to be underway soon because all the approvals have been received, and the New Projects for which approval is to be requested from the Supported Nation, from the Supporting Nation(s) and from the appropriate Panel) will be distributed to the National Delegates as a separate document (the same procedure having been used for the list of Working Groups).

The proposed funding for this total effort: Support of Panel members and Support of Collaborative Projects is 2.309 million French francs.

MILITARY COMMITTEE STUDIES

AEROSPACE APPLICATIONS STUDIES COMMITTEE

Chairman: Mr C.COXHEAD, UK

MILITARY COMMITTEE STUDIES DIVISION

Chief: Colonel V.CLINE, US
Deputy: To be appointed
Deputy: Mr A.WOWK, Germany

PROGRAMME

Two studies were recommended by the Aerospace Applications Studies Committee in 1985: AAS-23 "Improved Self-Protection for Tactical Aircraft (Threat Warning, End-game Countermeasures and Manoeuvre)" and AAS-24 "System Concepts for Unmanned Fighter Aircraft in Beyond Visual Range Air-to-Air Engagements". AAS-23 was approved by the National Delegates Board and will start in September 1985. The Terms of Reference (TOR) for AAS-24 will be submitted to the National Delegates Board in September 1985; if approved the study will be reviewed by the AASC in November 1985, and considered by the National Delegates Board at the March 1986 meeting.

MEETINGS

AASC Meeting No.30 (Classified)	— Review Terms of Reference for AAS-25 and AAS-26 — Organize Study Group for AAS-25 — Review AAS-23 and AAS-24	9—11 June 1986 Germany
AASC Meeting No.31 (Classified)	— Review Terms of Reference for New Studies — Organize Study Group for AAS-26 — Review AAS-24 and AAS-25	10—12 November 1986 UK

PUBLICATIONS

Subject	*Projected Publication Date*
C^3I Concepts for the Attack of Time-Sensitive Targets by Land-Based and Air-Launched Weapons. Volume I (English and French), Volume II (English) (AAS-21) Advisory Report (NATO Secret)	February 1986
System Concepts for the Suppression of Enemy Ground-to-Air Defences in Aid of Offensive Air Operations. Volume I (English and French), Volume II (English) (AAS-22) Advisory Report (NATO Secret)	September 1986

HEADQUARTERS

OFFICE OF THE DIRECTOR

MEETINGS

60th NATIONAL DELEGATES BOARD MEETING 37th STEERING COMMITTEE MEETING 40th PANEL CHAIRMEN'S MEETING 16th NATIONAL COORDINATORS MEETING	24—28 March 1986 Paris, France
22nd AGARD ANNUAL MEETING 62st NATIONAL DELEGATES BOARD MEETING 41st PANEL CHAIRMEN'S MEETING	22—26 September 1986 Athens, Greece

PUBLICATIONS

Subject	*Projected Publication Date*
AGARD Bulletin 86/1 **AGARD Bulletin 86/2**	March 1986 September 1986
AGARD Highlights 86/1 **AGARD Highlights 86/2**	March 1986 September 1986
Calendar of Selected Aeronautical and Space Meetings 86/1 and 86/2	June 1986 December 1986

III – BUDGET SUMMARY

1986 TECHNICAL PROGRAMME

***(In Thousands of 1985 French Francs)**

Panels	1984 *Commitments*	1985 **MBC Approved*	1986 **Proposed*
AMP	248	269	429
AVP	265	400	482
EPP	401	369	417
FMP	507	436	500
FDP	933	799	770
GCP	308	516	388
PEP	455	653	756
SMP	641	700	755
TIP	191	417	442
SUB-TOTAL – PANELS	3,949	4,559	4,939
INDIVIDUAL CONSULTANTS	1,041	837	900
LECTURE SERIES	2,108	1,537	1,650
SUPPORT TO GREECE, PORTUGAL & TURKEY	1,961	2,141	2,309
MILITARY COMMITTEE STUDIES	180	124	230
HEADQUARTERS PUBLICATIONS	218	251	286
OTHER COSTS (Certificates, Layout Sheets, Forms, Meeting Announcements, Distribution)	433	551	564
SUB-TOTAL – OTHERS	5,941	5,441	4,939
AGARD TECHNICAL PROGRAMME			
GRAND TOTAL	9,890	10,000	10,878

IV – 1986 PUBLICATIONS SUMMARY

Activity	*Reports*	*Advisory Reports*	*AGARDographs*	*Conference Preprints*	*Conference Proceedings*	*Misc*	*Total*
AMP	–	–	2	–	3	–	5
AVP	–	3	–	2	3	–	8
EPP	–	2	–	2	3	1	8
FMP	–	2	1	–	2	–	5
FDP	1	3	2	2	1	2	11
GCP	–	4	1	–	3	–	8
PEP	–	1	3	3	5	–	12
SMP	5	–	1	–	2	1	9
TIP	2	–	–	1	1	1	5
CPP	–	–	–	–	–	6	6
MCS	–	6	–	–	–	–	6
HQ	–	–	–	–	–	6	12
TOTALS	8	21	10	10	23	17	89

END

DATE
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